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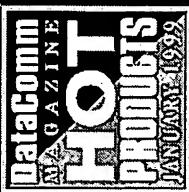
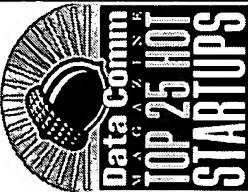
XACCT Technologies

Billing For Content -
Workshop

Limor Schweitzer
CTO
limor@xacct.com

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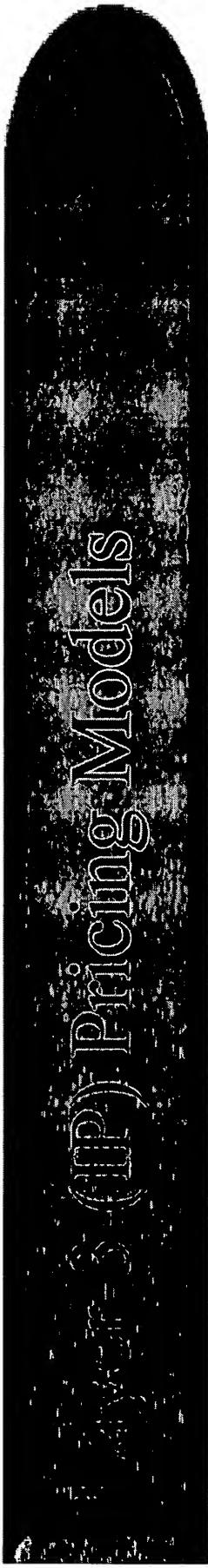
IIR / Amsterdam / IP
Network Billing / 16 Feb
2000



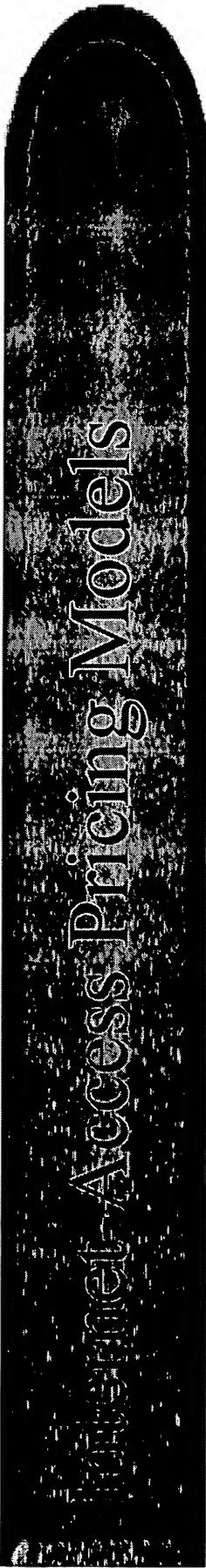
(1/3) Existing and Upcoming Data Pricing Models

ATM (FTR) Pricing Models

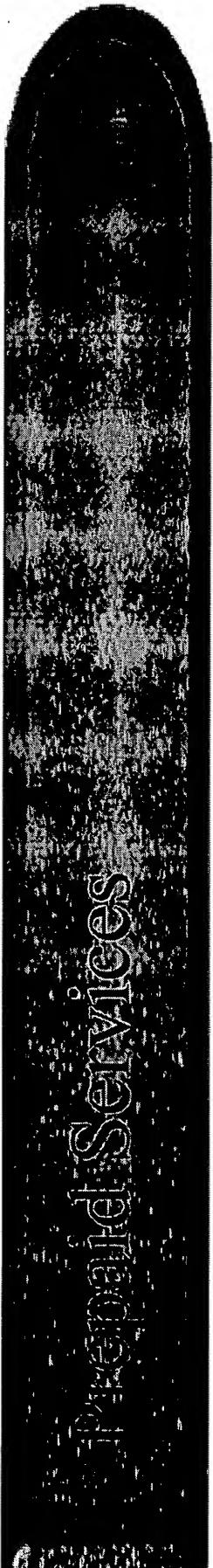
- Permanent virtual circuits (PVCs). Innovative billing approaches are required to offer new revenue opportunities for more transient switched virtual circuits (SVCs). Rating elements to enable innovative billing include:
 - *Time-based access*
 - Metered by SVC duration, time-of-day, and time-of-week
 - *Usage-sensitive charges for both PVCs and SVCs*
 - Based on data transmitted or received, peak bit rate, call rate, and excess volume surcharges
 - *QoS-based fees*
 - Based on service-specific parameters such as ATM traffic rates, available bit rate [ABR], constant bit rate [CBR], variable bit rate [VBR], and unspecified bit rate [UBR]) or Frame Relay committed information rate (CIR), and prioritization by access port or VC.



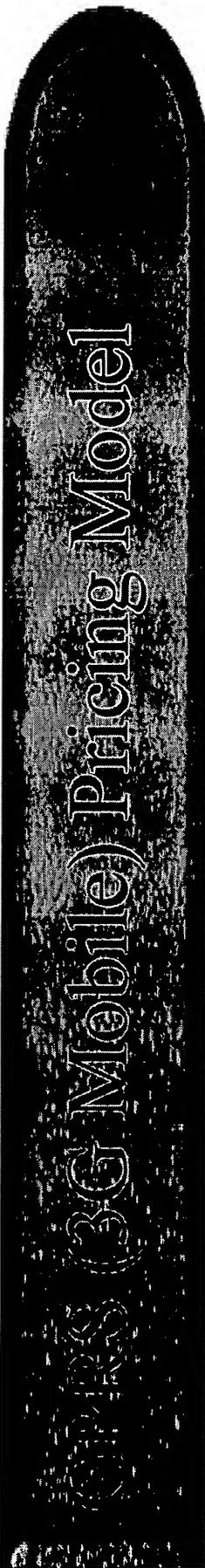
- **Time-based IP**
 - Metered by flow duration, time-of-day, and time-of-week
- **Usage-sensitive IP**
 - Based on peak bit rate, packet or octet counts, excess usage surcharges
- **Distance Sensitive**
 - Where price takes into account Destination and Distance (by associating IP and AS addresses to location, geography and remote carriers are identified)
- **Application and CoS-based IP**
 - Where tariffs depend upon application type (VoIP requires higher priority than email), IP Header - TOS bits, Source-based routing priorities, effective QoS measurements



- **Flat-rate "all-you-can-eat" Internet access**
 - A necessary baseline in today's market
- **Time-based access**
 - Metered by call duration, time-of-day, and time-of-week
- **Usage-sensitive access**
 - Based on octets transmitted or received, optionally combined with excess usage surcharges
- **Destination-, distance-, and carrier-based access**
 - Where tariffs rely on called and calling numbers
- **CoS-based access fees**
 - Based on speed and user/traffic priority



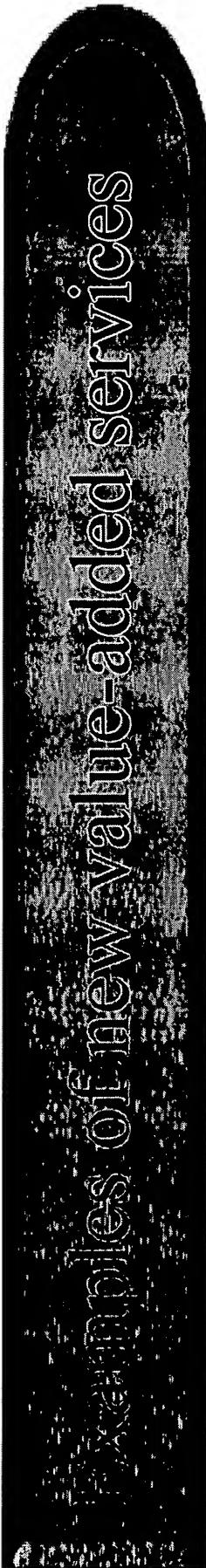
- Current implementations of prepaid
 - Time based services
 - VoIP minutes
 - Content based services (books, music...)
- Next Generation Prepaid Services
 - Volume
 - QoS * Volume
 - User selectable Service provider and QoS



- **Time, Volume-based**
 - per minute - voice/video
 - by bytes or throughput
 - Geography, Roaming
- **Transaction-based**
 - WAP/Web transactions
 - Content/Location-based-payment

Session-based Multi-layered Pricing Model

- **Time-based**
 - per minute
 - Time of day or Time or Week (Peak/Off Peak)
- **Application-or Application-class based**
 - Charged on the type of application being used
 - Charge based on service level or satisfaction levels for premium services (QoS, CoS)
 - Security level
- **Transaction-based**
 - Charged on the number of transactions used
 - Content-based- micro-payment
 - Movie, Games
- **Destination/distance-based**
 - Charge based on geography
- **xacct**
 - Intra-Inter domain - in or outside the network



- Application rental
 - ERP (e-business.bt.com), hotmail.com, presentation.net
 - Messaging (voicemail, fax, SMS - [e/j]fax.com)
- IP Music and Video Broadcast
 - Radio (spinner.com, mp3.com), Video (broadcast.com)
- Network Services
 - Interactive Voice/Video over IP ;long-distance gateways, UNPBX; IN/IP services (pac.com); PSTN-Internet redirect
 - Dynamic Service Provider Selection
- Clearinghouse Services
 - Single ISP bill for various types of micro-transactions

(2/3) IP Mediation Challenges

Challenges

Potentially 100K's events / second
hundreds of distributed elements

Data must be collected and aggregated
in real-time before sending to the ledger

Hybrid value chain of contracts and assets

No accounting standards

No permanent user identity
elements are not SLEA compliant



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Challenges

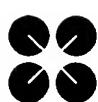
Network Devices and most Application Servers are not Customer-aware

Network Management Systems are customer-agnostic

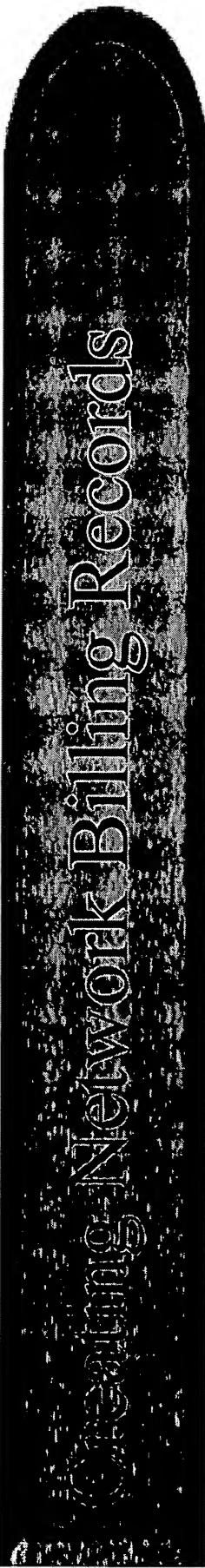
Customer Information is replicated across each system, accessed differently

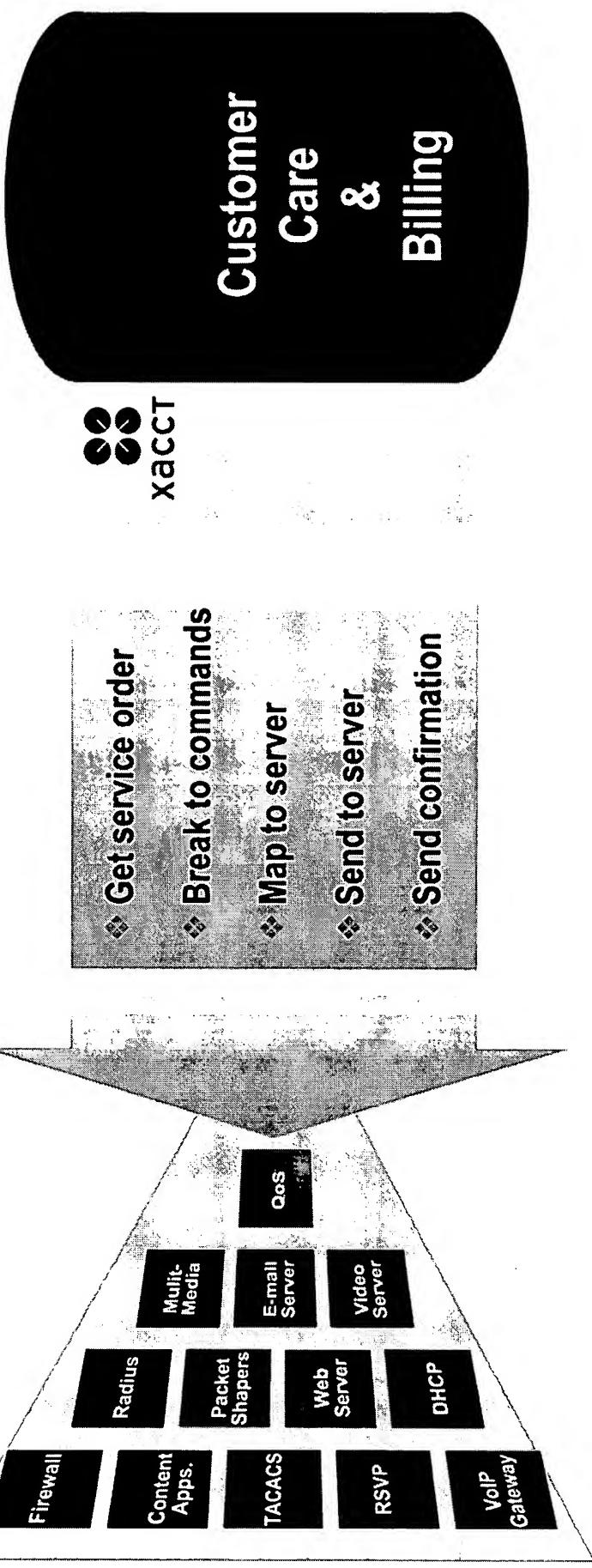
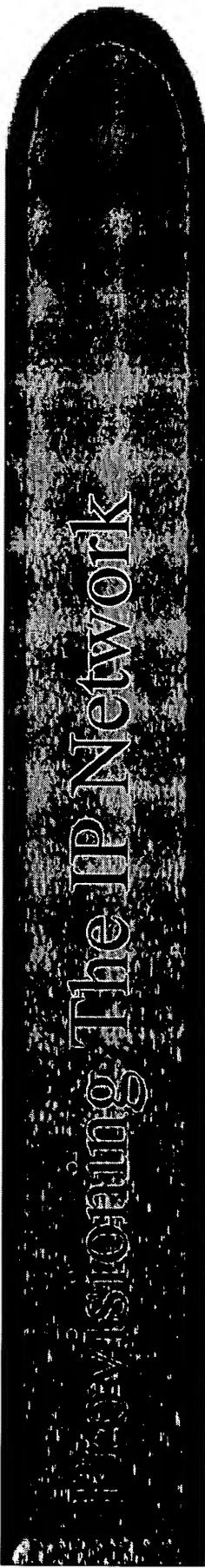
Transaction concepts missing, commit, resource locking, consistency

The promise of Directory Federation is not fulfilled

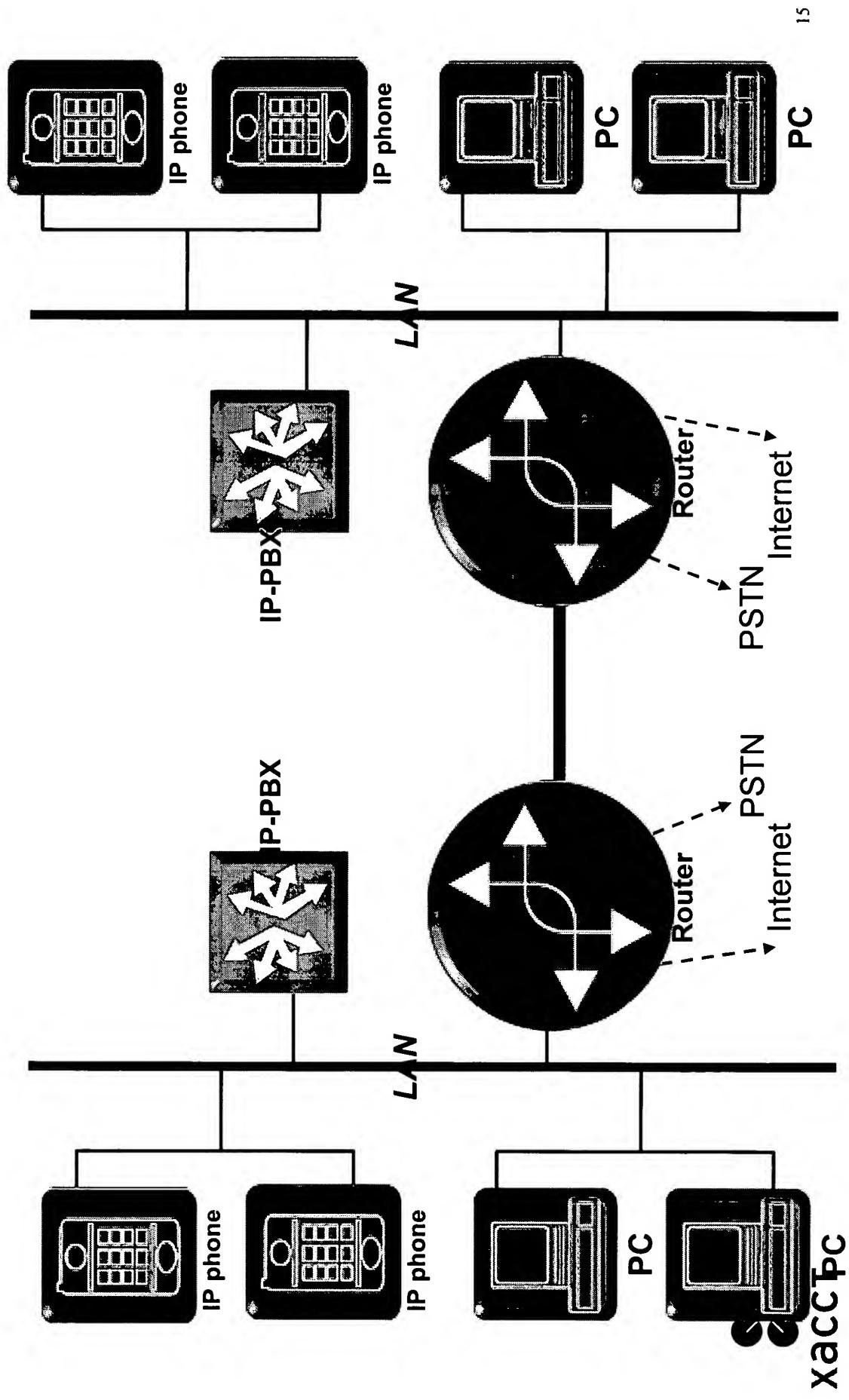


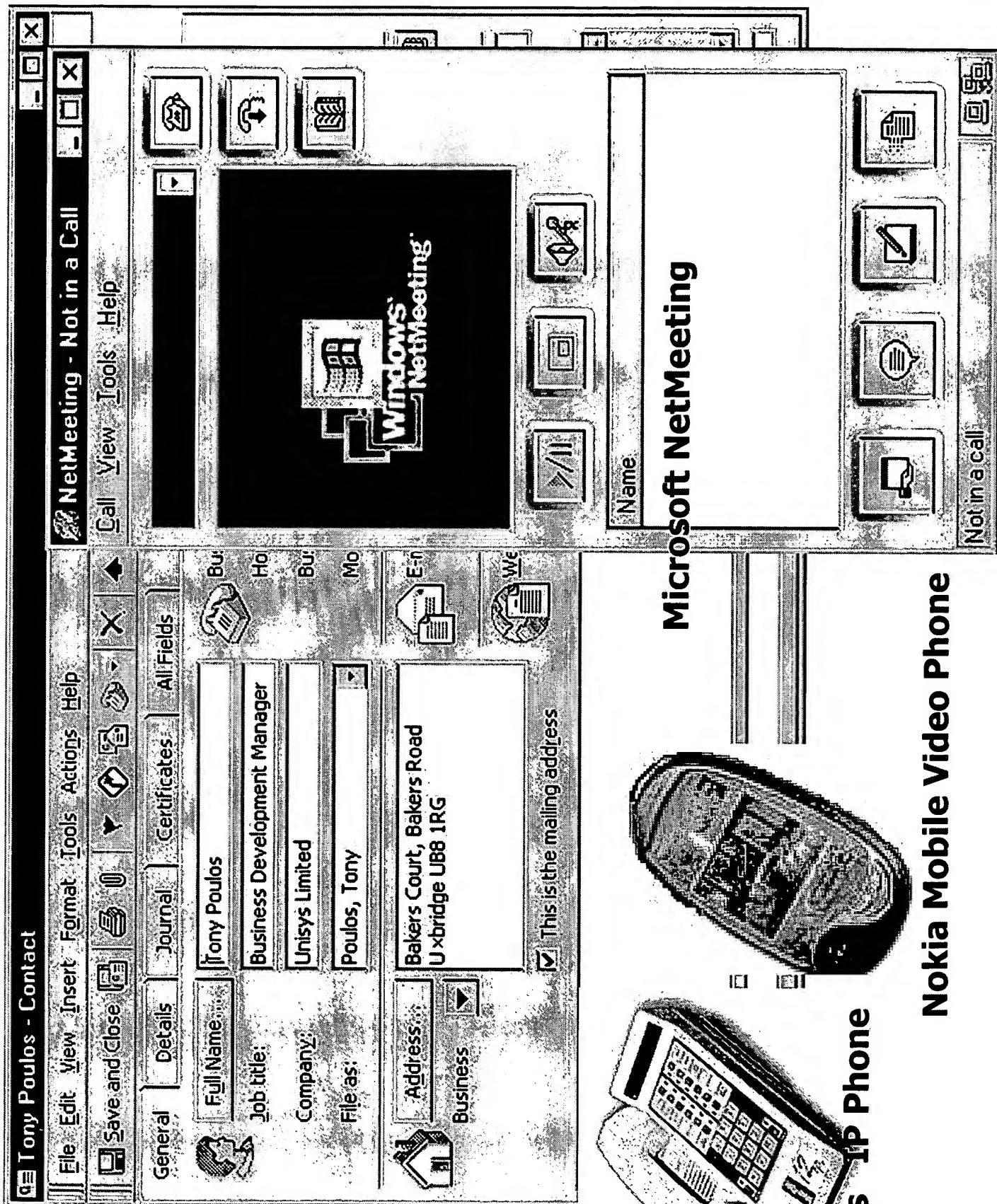
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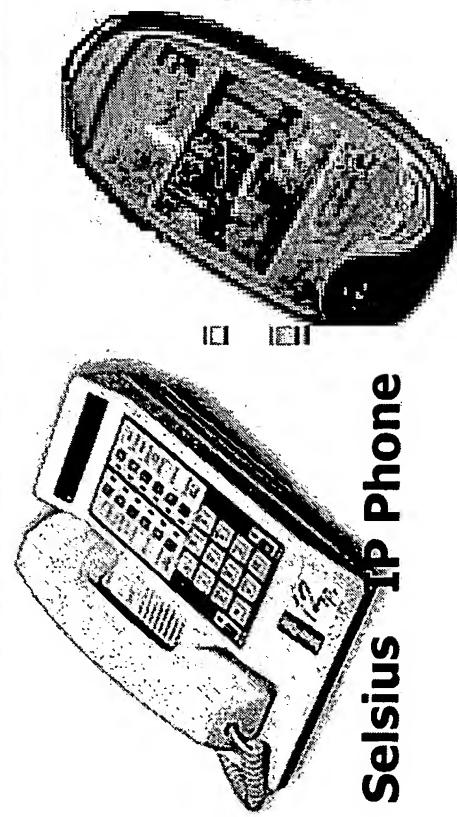


Voice over IP Inter-office architecture





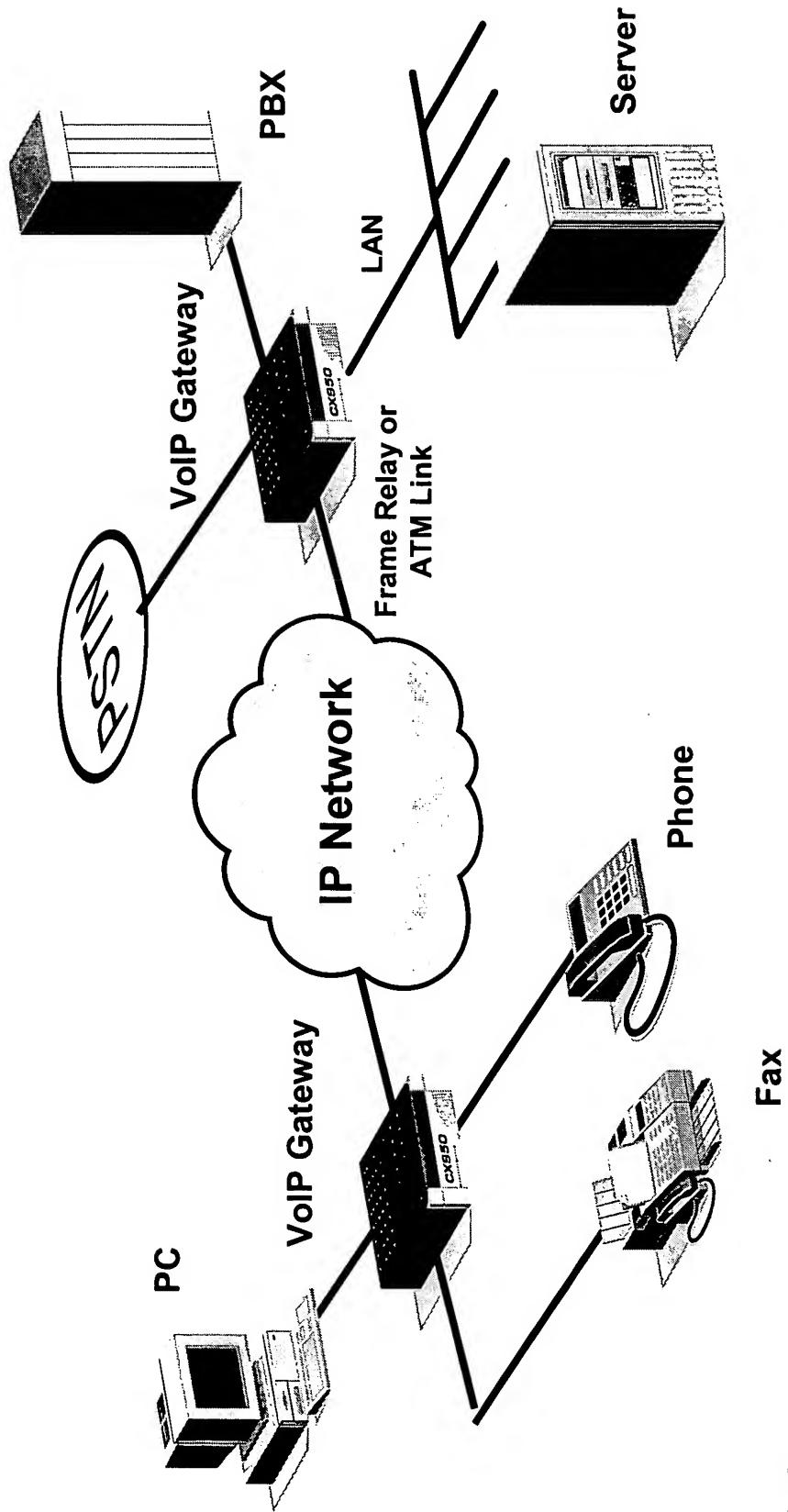
Microsoft NetMeeting



Nokia Mobile Video Phone

Selsius IP Phone

VoIP Topology



VoIP Gateway MIB Parameters

- Connection ID
- Origin IP address
- Calling Number
- Called Number
- Setup Time
- Connect Time
- Disconnect Time
- Disconnect Cause
- Disconnect Description
- Information Type (e.g. speech)
- Duration Payout Receive On-Time
- Selected QoS
- Round Trip Delay
- Receive Delay
- VAD Enable
- CPIF (Impairment Factor)

- Sent / Received / Total Packets
- Sent / Received / Total Bytes
- Transmit Path Open Duration
- Voice Duration
- Fax Duration
- Coder Rate
- Average Noise Level
- Average ACOM Level
- Session Target
- Charged Units
- Device Type
- Remote IP Address
- Remote UDP
- Gap Filled With Silence

- VoIP Physical Interface Index
- Telephone Dial Peer ID
- Telephone Logical Interface Index
- VoIP Logical Interface Index
- Gap Filled With Prediction
- Hi Water Playout Delay
- Low Water Playout Delay

Limitations of MIB:

- 500 entries

rolling table

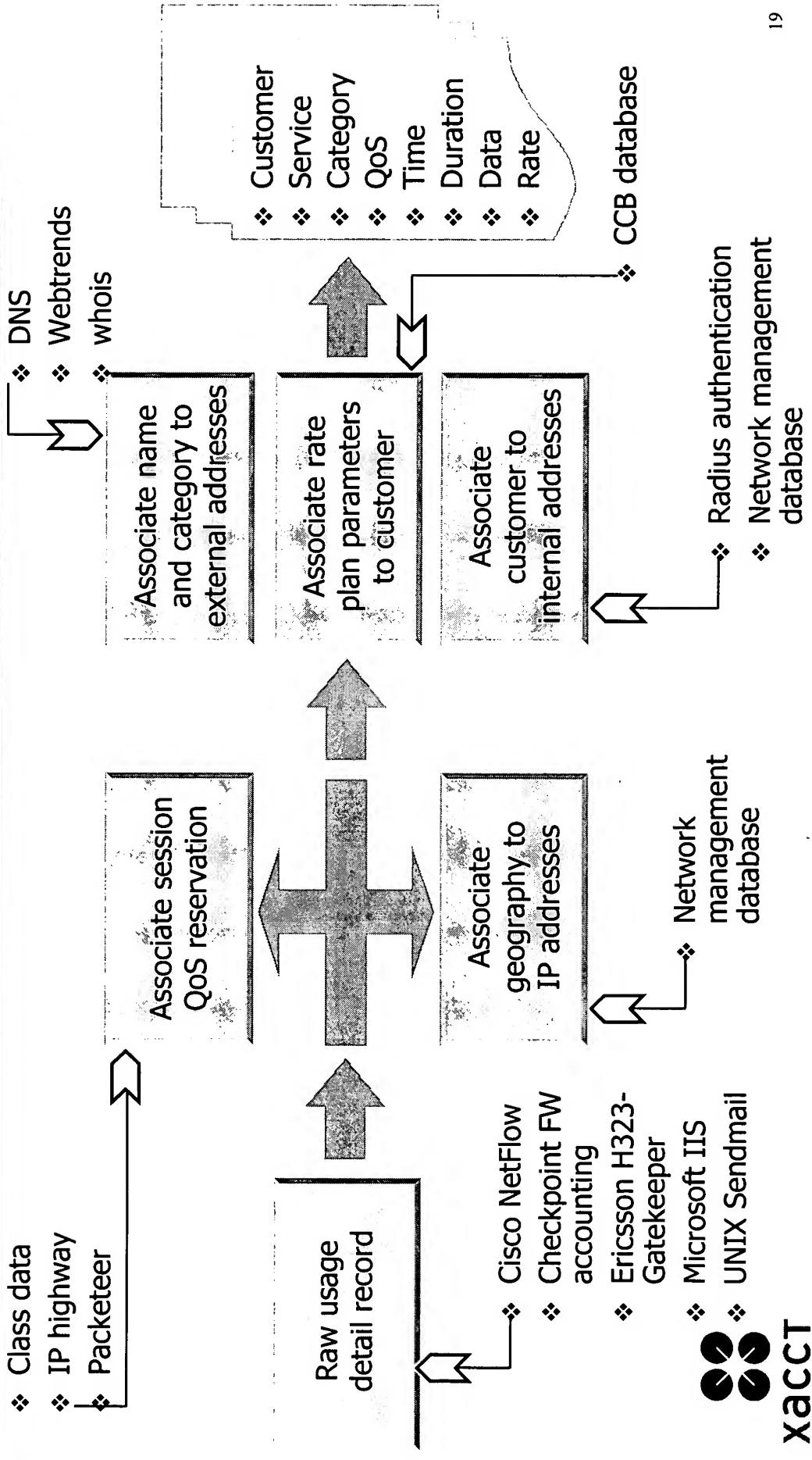
- events can be lost

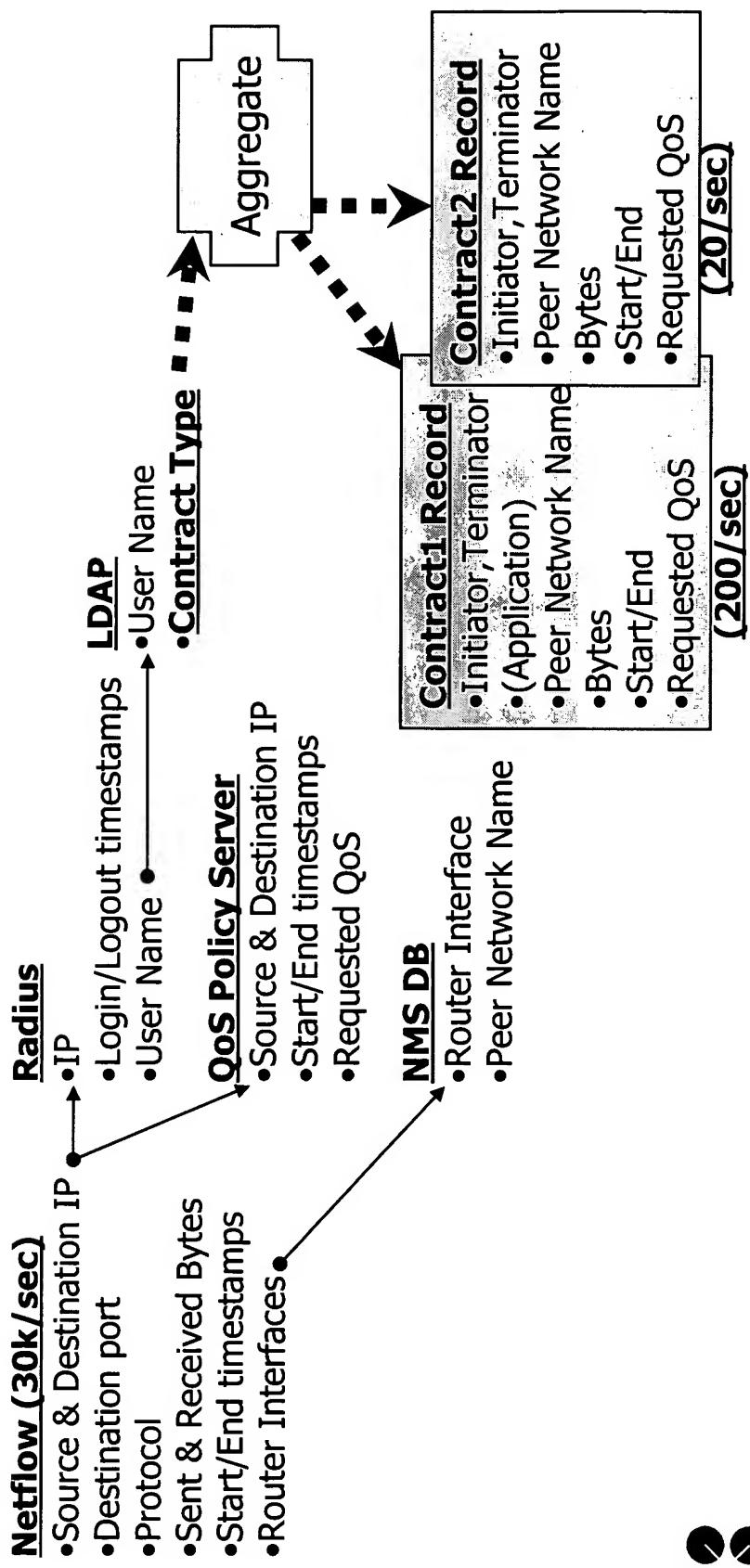
Solution

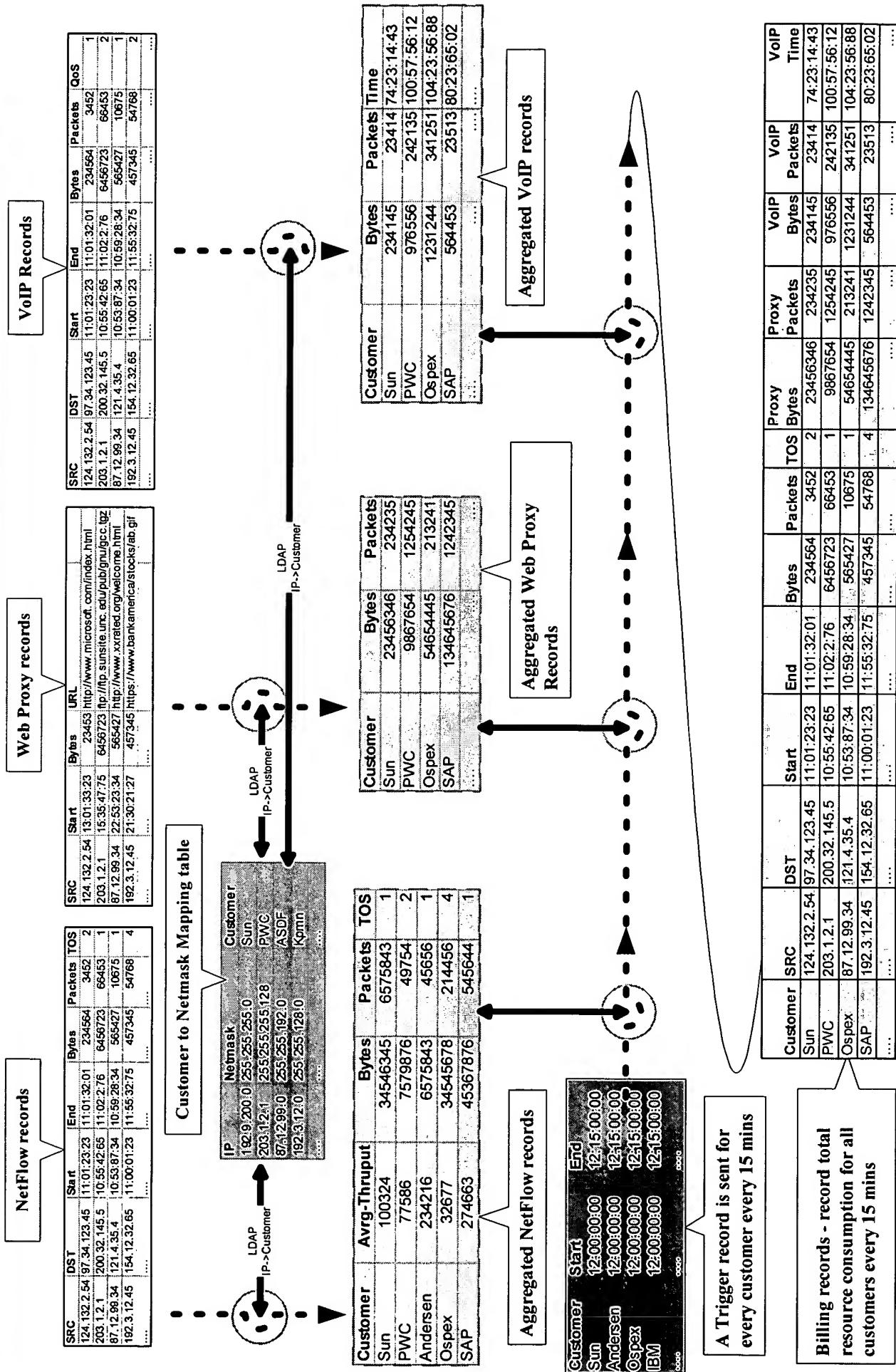
- Merge info with Radius accounting (reliably delivered but contain less metrics)

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ED-Billable Records

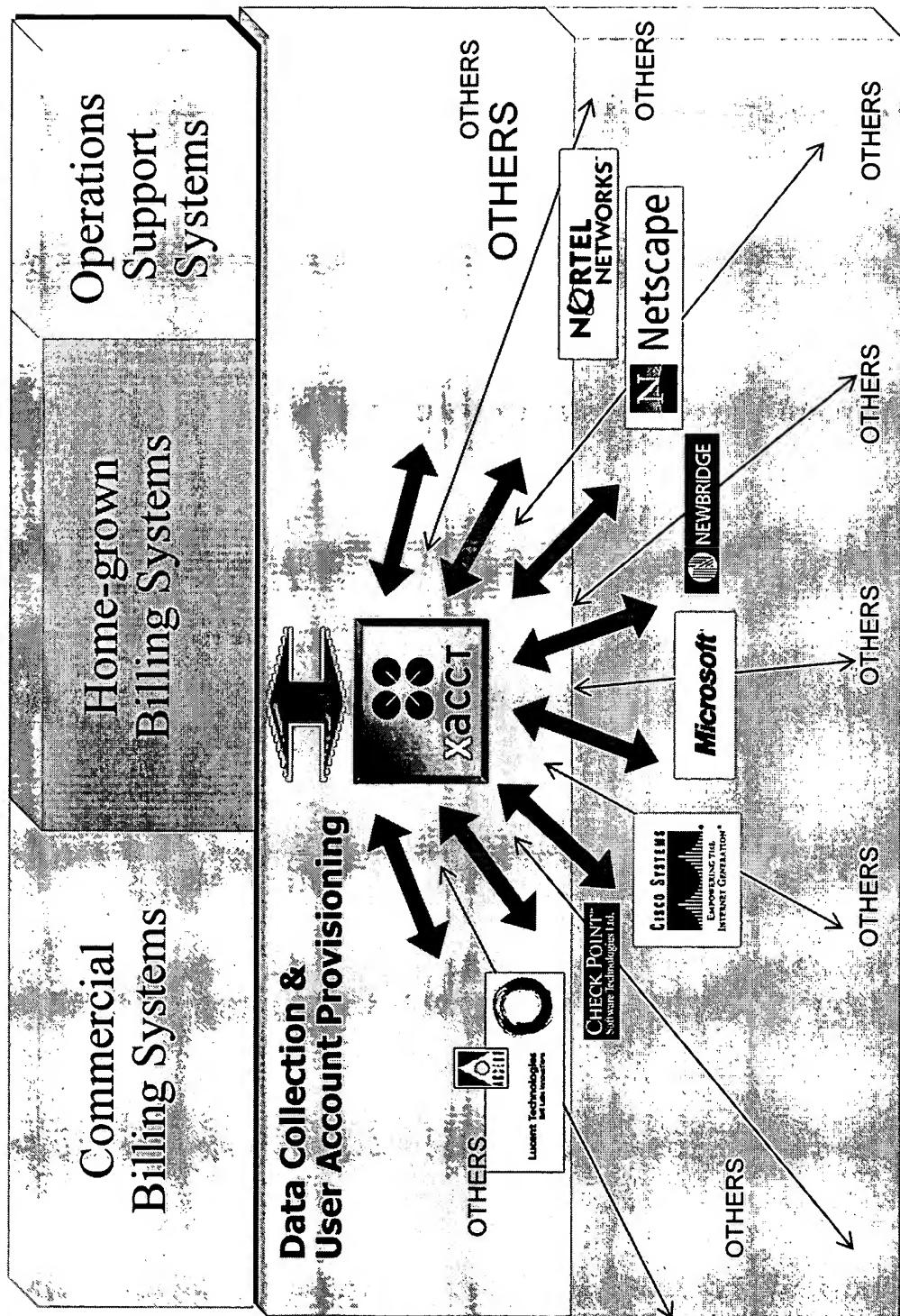






THE CHALLENGE FOR THE NEW Public Network

Tier 3 Tier 2 Tier 1

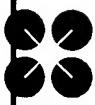


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(3/3) Pricing IP QoS

Service Quantified

Service \ QoS	Gold/High	Silver/Medium	Bronze/Low
Web Browsing	Incoming > 6 KB/s, Latency < 500 ms	Incoming <= 6 KB/s OR Latency < 800 ms	Incoming <= 2 KB/s OR Latency >= 800 ms
File transfer	Bandwidth > 20 KB/s	Bandwidth <= 20 KB/s	Bandwidth <= 5 KB/s
e-mail	Bandwidth > 100 KB/s	Bandwidth <= 100 KB/s	Bandwidth <= 2 KB/s
VoIP	Bi-directional > 5 KB/s, Packet Loss < 5%, Latency < 300 ms	Bi-directional <= 5 KB/s OR Packet Loss <= 25% OR Latency < 700 ms	Bi-directional <= 2 KB/s OR Packet Loss > 25% OR Latency >= 700 ms
Video Conferencing	Bi-directional > 48 KB/s, Packet Loss < 5%, Latency < 300 ms	Bi-directional <= 48 KB/s OR Packet Loss <= 25% OR Latency < 500 ms	Bi-directional <= 4 KB/s OR Packet Loss > 25% OR Latency >= 500 ms



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Model for IP QoS

Classical Data Transfer Price Model

Price ~ Distance

Price ~ Bandwidth

Price ~ 1/Latency

Price ~ Time

Price ~ 1/Line-Asymmetry

“Tolerable” QoS requirements for IP services

Application	Latency (in/out)	Throughput (in/out)	Jitter
E-mail	5 sec	8/1 Kbps	High
Web Browsing	1/1 sec	64/1 Kbps	High
FTP	1/1 sec	64/1 Kbps	High
Streaming Audio	500/200 ms	8/1 Kbps	High
Streaming Video	500/200 ms	32/1 Kbps	High
Audio Conference	50/50 ms	16/16 Kbps	Low

Application	Cost		
	QoS	Long Distance	International
IP Video	High Bandwidth	Low Latency	Local
IP Video	High Bandwidth	Low Latency	Bi
IP Video	Low Bandwidth	Low Latency	Bi
IP Voice	Low Bandwidth	Low Latency	Bi
Access to Information-server	High Bandwidth	High Latency	Uni
Fax and e-mail	Low Bandwidth	High Latency	Bi

Usage-based Contracts

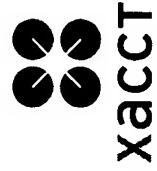
Name	Description	Cost
Standard	Unlimited 56Kbps modem Internet access (no guarantees for QoS, ie: slow)	20\$/month, 20Gb + 90hr limit
Total Corporate	Special package for corporate with at least 2 disparate offices. Including T1 link, VPN, 70hours IP telephony, minimum 64Kbps transfer rate between offices. Unlimited web during working hours. SAP transaction charges.	1000\$/month (per office) + 50% discount for failed QoS / SAP 0.01\$/transaction
Match Maker	Cyber age international video match-making/dating broker, meet your match using video chat conference system	2\$/match + 0.5\$/min
Homework Assistant	Multimedia conference for kids, teacher assisted homework get-together	0.3\$/min
IP Friends & Family	Make cheap telephone/video to predefined set of peers for cheap tariffs	0.05\$/min
Movie channel	Over 100,000 films and TV series streamed on-demand	0.1\$/min
Virtual Room-mate	2-way Circuit TV system for setting up peers so they can see and hear each-other 24 hr/day; for the challenged, home-bound etc.	100\$/month
Virtual Super-Market	Buy groceries without leaving home, controlling a robot in a real super-market.	2\$/pop + 0.4\$/min + articles

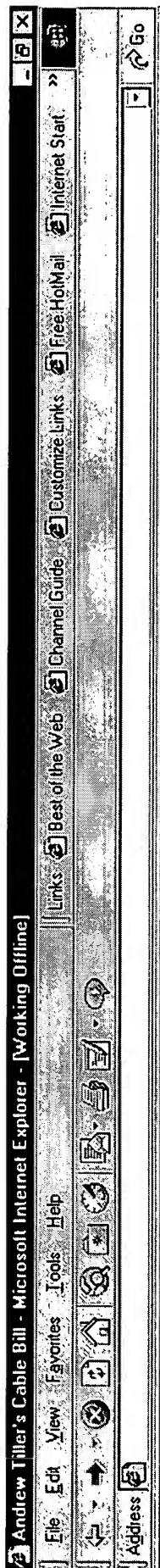
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Services Billable Parameters

Future pricing structures aren't clear, but the following parameters will be the building blocks.

Name	Description
Initiator	Billable entry - ID of who initiated the transaction
Terminator	ID of who received the transaction
Application	The Application used during the transaction
CoS	Class of service requested for the transaction (video, voice, web..)
Eff. QoS	Effective QoS as perceived by the parties
Throughput	Average throughput
Bytes In	Bytes received by Initiator
Bytes Out	Bytes received by Terminator
Start	Beginning of Session
End	End of Session
Duration	Duration of Session
Transit	Transit network to through which the session passed
Content	Type of content or tarif





GENEVA Geneva Telecom, The Old Granary, Westwick, Cambridge, CB4 5AR

Dr A Tiller
Distroxin. The Sycamores, Liverpool, L1 2AA

Charges for October 1999

Date	Time	Dialed to	Duration	Quality Requested	Quality Delivered	Cost (£)
02-Oct-99	10:01	Mum	10.23	Standard	Standard	0.63
05-Oct-99	19:23	Sally	04.28	Standard	Standard	0.15
11-Oct-99	09:20	Sally	31.46	Standard	High	1.91
11-Oct-99	22:30	Steve	01.10	High	High	0.17
17-Oct-99	08:23	Nerd	23.40	Standard	Standard	0.61
19-Oct-99	18:01	Mum	1:24.43	Standard	Low	2.54
20-Oct-99	11:07	Grandma	5.23	Standard	Standard	1.73

Conferences not remissed

Total before discounts

Quality of service discount

641
181 AL

Source: Geneva Technology

Done

Work reliably over the Internet.



Yes, I'm calling from my office.

Intelligence to right price IP Services

